DOCUMENT RESUME

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ABSTRACT

This student training module provides an introduction to the welding trade. (A companion instructor's guide is available separately as CE 032 888; other student modules are available as CE 032 890-891.) The modules are designed to introduce trade knowledge and skills to the student. This module contains a cover sheet listing module title, goal, and performance indicators; study guide/checklist with directions for module completion; information sheets providing background information about the welding trade; self-assessment; self-assessment answers; post assessment; and post-assessment answers for the instructor. Topics covered in the module include the many types or processes of welding and the future prospects for welding occupations. (KC)

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INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP PHASE 1 TRAINING.

INTRODUCTION TO THE WELDING TRADE

CE032889

CE06183

Goal:

The student will be able to explain and describe the uses of the many processes called welding.

Performance Indicators:

The student will demonstrate his or her knowledge by successfully completing a Self Assessment and a Post Assessment Exam.

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Study Guide

This guide is to be used as a "blueprint" to complete the module. Check off the following tasks as you complete them.

1. ____ Read the Goals and Performance Indicators on the cover of this module.

2. ____ Study the Information section. This will provide you with the information necessary to go on.

3. ____ Complete the Self Assessment exam and compare your answers with those on the Self Assessment Answer Sheet.

4. ____ Complete the Post Assessment exam and turn your answers in to your instructor.

Information

Welding may be considered either an ancient art or a modern skill. Evidence indicates that gold and brass were welded to make jewelry at least as far back as 2,000 B.C., and that iron was welded as early as 1,000 B.C. Surprisingly, the Industrial Revolution of the 19th Century was largely accomplished without the use of welding. Industrial welding is almost entirely a 20th Century advancement.

There are many processes called welding. All welding involves some process resulting in the fusion of two or more pieces of metal. Here we will identify the five major welding processes used most widely in industry today. These are: gas welding and cutting, arc welding, resistance welding, MIG welding and TIG welding.

Gas welding started in the 1850s with hydrogen and oxygen. In the 1890s, inexpensive acetylene was produced and oxy-acetylene welding started. Gas cutting changed the worlds of metal fabrication and cutting in 1907 and made the victory in WWI possible by making available the needed scrap steel for the war effort. This welding process involves the use of an intensely hot gas flame to melt and fuse the two metals , with or without additional metal added as filler.

Arc welding--in 1885, two Russian scientists received a British patent for using a carbon arc for cutting, piercing and gouging as well as for welding. Working with bare metal electrodes produced weak and brittle welds. The first coated electrodes appeared in 1910, but major advances in arc welding were not achieved until the 1940s, when it became the major steel welding process in industry. This process involves striking an electric arc between an electrode and the metal to be fused and, in maintaining the arc, depositing the melted electrode at the point where the fusion is taking place.

Electric Resistance Welding--In resistance welding, a high current is passed between two pieces of metal in contact. Electrical resistance generates a high heat and fusion takes place at the spot where the electrodes create pressure. Basically this is spot welding and a seam can be welded with a series of overlapping spot welds. Resistance welding equipment is generally heavy and designed for a single application. This welding process remains a major production method in sheet metal fabrication.

TIG Welding--(GTAW) Gas tungsten arc welding was developed during WWII in answer to a need for welding magnesium metals. In TIG welding, an arc between a tungsten electrode and the work is shielded by a stream of inert gas (argon, helium, or a mixture of the two). This protects both the electrode and the metal from the air which would cause impurities and other harmful effects in the weld. Though TIG welding is relatively expensive, this process is widely used today for magnesium, aluminum, titanium, stainless steel and other "exotic" metals.

MIG Welding--(GMAW) Gas metal arc welding grew out of TIG welding. Here the electrode is a continuously fed wire which melts into the work with the heat of the arc. This work is protected by a shielding gas. MIG welding is being applied in a greater variety of high production applications every day.

These are the major processes used in industry. Which process is used is determined by the kinds of metal to be joined, the costs involved, the kind of products to be made and the production techniques. Some of the other welding processes used today include:

a. forge welding
b. submerged arc welding
c. electroslag welding
d. flux-coved arc welding
e. plasma arc welding
f. electron beam welding
g. laser beam welding

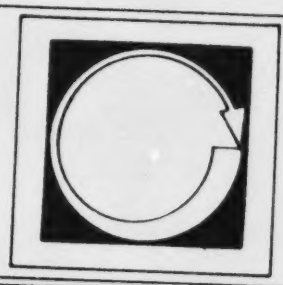
Plasma arc is used extensively for cutting aluminum and stainless steel and for welding the thinner metals: as thin as .001-inch. Laser and electron beam welding

are fairly new processes and are expected to become very important in the near future.

The future of welding is exciting. As raw materials become more expensive and even hard to find, rework and repair of old equipment and products takes on an ever-growing importance and welding is almost always a part of the process. The field of welding is expanding and growing and will continue to do so.

Welding is performed in almost any location and under almost any conditions. One may be working in sub-arctic or tropical climes, hanging in mid-air on a towering structure, or underwater. A welder may be working in mud under a tractor, scrunched down in a corner in the crowded bowels of a ship, or in a very clean room in a modern industrial complex. There is a place and condition to satisfy the most rugged or the most fastidious individual. Where one chooses to work, and obtains employment depends on the person's choice and his or her education, training and experience.

Self Assessment



Complete each statement by writing the appropriate word or phrase in the blanks provided.

1. _____ and _____ were welded as far back as 2,000 B.C.

2. Welding involves some process resulting in the _____ of two or more metals.

3. Gas welding started in the 18___.

4. Acetylene was produced in the _____.

5. Electrodes are used in _____ welding.

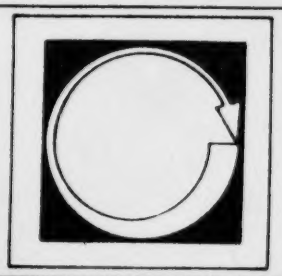
6. MIG welding relies on a continuously fed _____.

7. _____ welding is most widely used in the welding of titanium.

Self Assessment Answers

1. gold, brass
2. fusion
3. 50s
4. 1890s
5. arc
6. wire
7. TIG

Post Assessment



Select the word or words which correctly answers the question or completes the statement and write its corresponding letter in the blank space provided.

1. ____ What were the two gases first used in gas welding?

   a. carbon dioxide
   b. helium and petrol
   c. hydrogen and oxygen

2. ____ The first coated electrodes appeared in:

   a. 1910
   b. 1810
   c. 1950

3. ____ What kind of arc is established in arc welding?

   a. Noah's
   b. electric
   c. electronic

4. ____ What melts in arc welding?

   a. arc
   b. electrode
   c. diode

5. ____ What does TIG stand for?

   a. typical induction gaffe
   b. gas tungsten arc
   c. gas metal arc

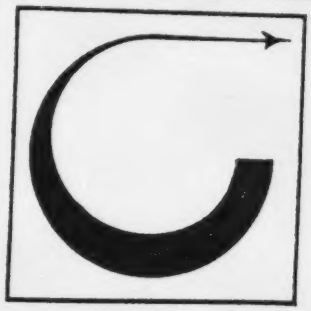
6. ___ Which welding process uses a continuously-fed wire?

   a. electrode arc
   b. TIG
   c. MIG

7. ___ Exotic metals are generally welded by the _____ process.

   a. TIG
   b. BIG
   c. MIG

Instructor Post Assessment Answers



1. c
2. a
3. b
4. b
5. b
6. c
7. a